

Nature-Based Solutions for Demonstrating Climate-Resilient Critical Infrastructure



Deliverable 3.2:
List of KPI for monitoring the demonstrators and the effectiveness of NbS



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Executive Summary

Climate change and the rising incidence of floods, landslides, wildfires, erosion and heat stress threatens the stability and operability of European infrastructure. NATURE-DEMO responds by demonstrating how Nature-based Solutions (NbS) strengthen resilience through ecosystem services. Within WP3, five Living Labs serve as real-world testbeds where NbS are co-designed, implemented and assessed with continuous monitoring and stakeholder participation. A structured, comparable and operational KPI set underpins this work, enabling rigorous evaluation of NbS performance and resulting infrastructure resilience.

Deliverable D3.2 provides a version-controlled KPI catalogue that operationalises WP3 monitoring, bridging D3.1 (conceptual design) to implementation and evaluation. It enables consistent tracking of NbS performance across four dimensions—Technical, Environmental, Socio-economic and Governance—capturing both risk-reduction outcomes and wider ecosystem/community co-benefits. The scope is twofold: (i) a core, cross-site set of generic KPIs for comparability and portfolio-level reporting; and (ii) site-specific KPIs tailored to local hazards, infrastructure vulnerabilities, NbS typologies and stakeholder priorities for context-sensitive evaluation. Developed via literature review and alignment with EU/international standards alongside iterative stakeholder engagement (Task 3.2), the indicators are delivered as standardised factsheets—code/title, definition, unit, method, frequency, data source, applicability—ready for integration into the project’s digital workflows and routine monitoring.

A two-layer KPI framework was delivered: a cross-site set of 20 generic indicators (Technical, Environmental, Socio-economic, Governance) and targeted, site-specific metrics aligned to local hazards, NbS typologies and feasible monitoring. Co-development with partners and a stakeholder survey (five criteria, 1–5 scale) ensured comparability and operational relevance. Generic KPIs showed strong acceptance (≈ 3.85 – 4.28), led by Resilience/Recovery and Soil Stability; Hydrological Regulation and Water Availability also exceeded 4.0. Socio-economic/governance validation prioritised Equity of Benefits and Social Cohesion, while economic items (Operational Cost, Avoided Damage Value, Cost–Benefit Ratio) were valued but data-intensive. Site assessments confirm readiness: Austria focuses on sediment and peak-flow control; Romania on vegetation performance and heat mitigation; Slovenia on hydro-geomorphic signals; Slovakia on slope displacement, vegetation cover and sediment trapping (incl. fire-support); North Macedonia on vegetation dynamics and slope stability, with a sediment-balance metric to refine. The result is a version-controlled catalogue with standardised factsheets and clear generic–site mappings, ready for digital integration.

D3.2 consolidates a comparable yet context-sensitive KPI framework, structured for direct operational use and portfolio-level reporting. Standardised factsheets (code/title, definition, unit, method, frequency, data source, applicability) create clear interfaces to digital components, enabling evidence-based evaluation of NbS performance and co-benefits. Immediate priorities are to integrate the KPI data model with the WP4 dashboard (unique IDs, versioning, ingestion/visualisation rules) and to establish periodic update protocols with KPI-level frequencies, roles and QA/QC checkpoints. As most NbS are not yet implemented, the catalogue will function as a living specification: indicators and units may be completed, supplemented or—where justified—substituted during design, construction, commissioning and

early operation. Any change will preserve indicator intent and cross-site comparability, be fully version-documented and maintain baseline continuity or transparently re-baseline as needed. These steps embed the framework in routine monitoring, support adaptive management and strengthen cross-site learning and replication.

Contents

Deliverable Factsheet	3
Executive Summary	4
Nomenclature	11
1 Introduction	12
1.1 The Role of KPIs in Assessing Nature-Based Solutions	12
1.2 Overview of the KPI Framework	13
1.3 Purpose & Scope	14
1.4 Relevance with other Work Packages and Deliverables	16
1.5 Contents of this Report	17
2 KPIs Identification, Methodology and Classification	18
2.1 Methodological Approach	18
2.1.1 Review of Existing Literature and Standards	18
2.1.2 Integration of Internal Project Resources	18
2.1.3 Mapping of Demonstrator Characteristics and Monitoring Needs	19
2.1.4 Stakeholder Input and Co-development	19
2.1.5 Consolidation and Expert Review	19
2.2 Selection Criteria	20
2.3 Classification Dimensions	20
2.4 Indicator Description Template	21
2.5 Limitations and Considerations	22
3 3 Catalogue of KPIs	24
3.1 Overview	24
3.2 Generic KPIs	24
3.3 Site-specific KPIs	27
3.3.1 DEMO 1A – Austria: Lattenbach Valley	28
3.3.2 DEMO 1B – Austria - Brunntal	28
3.3.3 DEMO 2 – Romania - Brasov	30
3.3.4 DEMO 3 – Slovenia - Gradaščica River	30
3.3.5 DEMO 4 – Slovakia – Zvolen	31
3.3.6 DEMO 5 – North Macedonia – Globocica	32
4 Evaluation of KPIs from Project stakeholders	34
4.1 Evaluation Procedure	34
4.2 Results from Evaluation of Generic KPIs	37
4.3 Results from Evaluation of Site-Specific KPIs	40
4.3.1 Demo 1A - Austria - Lattenbach Valley	40
4.3.2 Demo 1B – Austria - Brunntal	41
4.3.3 Demo 2 – Romania – Brasov	44

4.3.4 Demo 3 – Slovenia – Gradaščica River	46
4.3.5 Demo 4 – Slovakia – Zvolen	48
4.3.6 Demo 5 – North Macedonia – Globocica	50
4.4 Evaluation of Socioeconomic KPIs	52
5 Conclusions	54
Bibliography	56
Annex A KPIs Factsheets	58
History of Changes	110